SOURCES OF RESISTANCE IN ALFALFA TO *LYGUS HESPERUS* KNIGHT

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SUMMARY

Among 98 cultivars and experimental lines of alfalfa evaluated at the seedling stage for resistance to Lygus hesperus Knight, 'Culver', 'Travois', and 'Nomad' of the hardy group; 'Cody', 'Kanza', and 'Lahontan' of the semihardy group; and 'T-3-12', 'M-5-44 Syn B', and 'California Common' of the nonhardy group of alfalfas had the highest percentage seedling survival. These alfalfas may be considered as the most promising genetic sources of resistance to L. hesperus.

INTRODUCTION

Lygus hesperus Knight is one of the most important economic pests of alfalfa, cotton, and other crops grown for seed in the Western United States. The primary host of the species is alfalfa, which is also a major source of lygus infestation for cotton and other crops in Arizona and California. Lygus-resistant alfalfa cultivars are an effective means of suppressing lygus populations in alfalfa so that dispersal of lygus to other crops is greatly minimized. Moreover, use of insecticides for control of the pest may be substantially reduced or even eliminated.

Unfortunately, cultivars with resistance to species of Lygus have not been developed. However, evaluation of alfalfa cultivars and experimental alfalfas for resistance to Lygus spp. have been reported by Aamodt and Carlson (1), 2/ Malcolm (3), Nielson and Schonhorst (4), and Lindquist et al. (2). Studies of resistance in other crops to Lygus spp. have also been reported (5, 6, 7).

Among alfalfas evaluated in the mature growth stage, three cultivars were recommended by Nielson and Schonhorst (4) as sources of germ plasm for resistance to L. hesperus. Lindquist et al. (2) provided an assessment of seedling tolerance of 16 cultivars to L. lineolaris (Palisot de Beauvois). Our paper describes an evaluation of 98 alfalfas for resistance, in the seedling stage, to L. hesperus.

MATERIALS AND METHODS

Percentage seed germination was predetermined for all alfalfas before evaluation tests were begun. Seed of entries (cultivars) having fewer than 90 percent germination were scarified. Growth characteristics of 98 alfalfa cultivars and experimentals were also preassessed; 14 were semihardy types, 42 entries were hardy types, and 42 were nonhardy types. Each of the three groups was evaluated separately to avoid interaction between cultivars and growth types that was evident in earlier studies of

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2/ Underscored numbers in parentheses refer to Literature Cited at the end of the report.

resistance (4). However, Lindquist et al. (2) reported no cultivar by growth type interaction in studies of seedling resistance of 'Lahontan' (dormant) and 'Sirsa 9' (nondormant) to Lygus lineolaris.

Fifty seeds of each entry were planted in radial rows, seven rows per flat, in galvanized circular pans 4 inches deep and 15 inches in diameter. Each entry was replicated four times, and all entries were randomized in each replicated flat. Replicated tests of the semihardy group were run simultaneously, whereas those of the hardy and nonhardy groups were run sequentially. When the seedlings were in the unifoliolate leaf stage, field-collected adult lygus bugs were caged at random on the plants at a population ratio of one adult to two seedlings. The numbers of surviving seedlings were recorded twice, 10 and 15 days after the date of infestation. Percentage survival of the plants was based on the last count. All tests were done in the greenhouse from April through October 1972. Temperatures ranged from 13° to 27° C during the first 3 months and from 18° to 30° C during the last 3 months. Supplemental light was provided for the 12 hours during daytime periods.

RESULTS AND CONCLUSIONS

Analysis of the resistance to L. hesperus of the semihardy, hardy, and nonhardy groups showed highly significant differences in seedling survival among alfalfa cultivars within groups, as shown in the following list:

Entry	Mean percent seedling survival 1/	Entry	Mean percent seedling survival 1/
Semihardy alfalfa		Hardy alfalfa	
Washoe	15.50 a	Cherokee	35.25 abc
Alfa	15.80 a	Cayuga	37.75 abcd
N-78	18.18 a	N.C. Syn G3	38.50 abcd
Caliverde 65	23.75 ab	Imperial 70	40.00 abcde
Dupuits	23.95 ab	N.C. Syn G2	42.50 abcdef
Mesilla	24.88 abc	Ladak 65	42.75 abcdef
Zia	25.00 abc	Atlantic	43.00 abcedf
Buffalo	25.05 abc	Team	43.05 abcdef
Williamsburg	27.70 abc	Roamer	44.40 abcdef
Talent	28.65 abc	Pilca Butta	46.00 abcdef
AS-49	29.95 abc	N.C. Syn B	46.75 abcdef
Cody	34.68 bc	Ranger	47.75 abcdef
Kanza	36.78 bc	Mark II	47.75 abcdef
Lahontan	39.55 c	Iroquois	48.00 abcdef
Hardy alfalfa		Tourneur 505	48.75 abcdef
WL 508	29.50 a	Dawson	50.25 bcdef
N.C. Syn F_2	32.50 ab	New Mexico 11-1	51.00 bcdefg

See footnote at end of list.

Entry	Mean percent seedling survival 1/		Entry	Mean percent seedling survival 1/	
Hardy alfalfa			Nonhardy alfalfa		
N.C. Syn A	51.05	bcdef	Sonora	51.5	abcd
Meeker Baltic	51.50	bcdefg	80-78-1	51.6	abcd
Kansas Common	52.75	cdefg	Joaquin 11	52.2	abcd
Grimm	54.00	cdefg	WL 451	52.8	abcd
FD 100	54.25	cdefg	Mission 63	53.0	abcd
Saranac	54.50	cdefg	WL 450	53.0	abcd
Orestan	54.65	cdefg	NK 919	54.8	abcd
Chillicothe	55.00	cdefg	Sonora 70	55.2	abcd
Argentine Common	55.50	defg	Salton	55.2	abcd
Oklahoma Common	56.25	defg	Indian	55.6	abcd
A-223	56.37	defg	SW-44	55.6	abcd
Teton	56.75	defg	Root Rot GPX	56.0	abcd
Uinta	57.00	defg	M-56-11 TC	56.0	abcde
Weevlcheck	57.25	defg	Sirsa #9	57.2	abcde
Vernal	58.50	efg	Y-56-423 PX Syn A	57.5	abcde
Scout	58.50	efg	Abunda Verde	58.2	abcde
Narragansett	59.25	efg	NK 819	58.5	abcde
A-227	59.37	efg	Caliverde	58.8	abcde
Rambler	59.50	efg	Moapa 69	59.5	abcde
N.C. Syn D	60.50	fg	Mesa Sirsa	59.8	abcde
Culver	61.75	fg	Caliente	59.9	abcde
Travois	62.50	fg	Hayden	60.5	bcde
Nomad	70.25	g	Bonanza (Root Rot Res.)	60.8	bcde
Nonhardy alfalfa			El-Unico Syn 2	61.0	bcde
El Camino	40.9	a	Caliverde	62.1	cde
WL 501	42.0	ab	Border 9 Crop 69	63.5	cde
N-71	45.5	abc	AS-13	63.8	cde
Ariz-Mex-Son 69	47.2	abc	Sirsa Polycross-Ed-9	64.2	cde
African	48.3	abcd	Hairy Peruvian	65.8	de
Moapa	48.7	abcd	SW-17	66.8	de
80-118-4	50.2	abcd	T-3-12	67.2	de
El Dorado	50.8	abcd	M-5-44 Syn B	74.1	e
DeKalb 183	51.1	abcd	California Common	75.0	e

1/ Means followed by the same letter(s) are not significantly different at the 0.05 level.

Significant differences among replications were also found. Among 14 entries of the semihardy group, 'Cody', 'Kanza', and 'Lahontan' had the highest percentage seedling survival (34 to 39 percent). Among 42 hardy alfalfas, 'Culver', 'Travois', and 'Nomad' had the highest percentage seedling survival (61 to 70 percent). Among 42 nonhardy alfalfas, experimentals 'T-3-12', 'M-5-44 Syn B', and 'California Common' had the highest percentage seedling survival (67 to 75 percent). All of these alfalfas are considered possible sources of germ plasm for resistance to L. hesperus within their respective hardiness group.

Factors that influenced test results were environmental (light and temperature), biological (sex and age of test adults), and physical (cage effect). First, germination of seeds and growth of seedlings were affected by light in tests of the semihardy group. Seedlings in two replications on the shadow side of the greenhouse were retarded, whereas seedlings in two replications on the sunlight side were not; thus, growth differences were more pronounced at the time of infestation and during the test. Secondly, one replication in each of the hardy and nonhardy groups received a greater population of females than males, and more seedlings were killed by females than when the population of the sexes was equal. Unpublished studies showed that females killed from 20 to 50 percent more seedlings than males in tests when the sexes were separated. When sexes were combined, seedling mortality of plants was intermediate. Finally, lygus bugs killed more plants along the periphery than in the middle of the cage. Congregation of bugs along the side of the cage was possibly due to a light effect.

DISCUSSION

Variability was a common occurrence in data on evaluation of lygus resistance in alfalfa. Coefficient of variation ranged from 20 to 60 percent in several studies. Significant F values obtained among replications within each group of different growth characteristics reflected the amount of variation in these tests. Experimental design reduced some variability (radial rows, separation of growth types, uniform percentage of seed germination). The variability in these data suggests caution in the interpretation of the results. Subsequent tests of these cultivars should incorporate means of alleviating known variables by using unbiased cage methods, equitable experimental design, additional replication of the cultivars, and equal age and population of sexes.

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